

TEST REPORT

Report No.: HK09050713-1

i.Tech Dynamic Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: RKIC51-B305-XX)

Transceiver

Prepared and Checked by:



Terry Chan/si
Lead Engineer

Approved by:



Ho Wai Kin, Ben
Senior Supervisor
Date: May 18, 2009

- The test report only allows to be revised within the retention period unless further standard or the requirement was noticed.
- This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

INTERTEK TESTING SERVICES

GENERAL INFORMATION

i.Tech Dynamic Ltd.
BRAND NAME: i.Tech, MODEL: C51-B305-XX

FCC ID: RKIC51-B305-XX

Grantee:	i.Tech Dynamic Ltd.
Grantee Address:	5/F., Harbourfront Landmark, 11 Wan Hoi Street, Hung Hom, Kowloon, Hong Kong.
Contact Person:	Mr. Danny Wong
Tel:	852-2460 6762
Fax:	852-2460 6832
e-mail:	N/A
Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	i.Tech
Model:	C51-B305-XX
Type of EUT:	Transceiver
Description of EUT:	i.Tech i.Car Kit 305
Serial Number:	N/A
FCC ID	RKIC51-B305-XX
Date of Sample Submitted:	May 13, 2009
Date of Test:	May 13, 2009
Report No.:	HK09050713-1
Report Date:	May 18, 2009
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

INTERTEK TESTING SERVICES

SUMMARY OF TEST RESULT

i.Tech Dynamic Ltd.
BRAND NAME: i.Tech, MODEL: C51-B305-XX

FCC ID: RKIC51-B305-XX

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Antenna Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
RF Exposure Compliance	15.247(i) / RSS-Gen 5.5	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.2	N/A
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	Pass
Receiver / Digital Device Radiated Emissions	15.109 / ICES-003	Pass
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

INTERTEK TESTING SERVICES

Table of Contents

1.0	<u>General Description</u>	1
1.1	Product Description	1
1.2	Related Submittal(s) Grants	1
1.3	Test Methodology	1
1.4	Test Facility	1
2.0	<u>System Test Configuration</u>	2
2.1	Justification	2
2.2	EUT Exercising Software	2
2.3	Special Accessories	2
2.4	Equipment Modification	2
2.5	Measurement Uncertainty	2
2.6	Support Equipment List and Description	3
3.0	<u>Emission Results</u>	3
3.1	Field Strength Calculation	3
3.2	Radiated Emission Configuration Photograph	4
3.3	Radiated Emission Data	4
4.0	<u>Equipment Photographs</u>	9
5.0	<u>Product Labelling</u>	9
6.0	<u>Technical Specifications</u>	9
7.0	<u>Instruction Manual</u>	9
8.0	<u>Miscellaneous Information</u>	9
8.1	Measured Bandedge	9
8.2	Discussion Pulse Desensitivity	10
8.3	Calculation of Average Factor	10
8.4	Emissions Test Procedures	10
9.0	<u>Equipment List</u>	11

INTERTEK TESTING SERVICES

1.0 General Description

1.1 Product Description

The EUT is a Bluetooth Headset, which is used inside the car. It operates at frequency range of 2402MHz to 2480MHz with 79 channels, and is powered by its cigarette charger (12VDC input) or internal charging battery. With Bluetooth wireless communications enable, the units allows the user uses a cordless handset to receive Bluetooth-equipped cellular phone via the cellular network or uses a corresponding Bluetooth-equipped headset and Handsfree.

Antenna Type : Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver. The receiver part of this transceiver is exempted from the Part 15 technical rules per 15.101(b).

1.3 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.4 (2003). And radiated measurements was performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

1.4 Test Facility

The open area test site facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

INTERTEK TESTING SERVICES

2.0 **System Test Configuration**

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The device was powered from its cigarette adaptor (Input: 12VDC).

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by i.Tech Dynamic Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

INTERTEK TESTING SERVICES

2.6 Support Equipment List and Description

1. Car adaptor.
2. 1 x USB to DC cable with length of 1.0 meter.

3.0 **Emission Results**

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where

- FS = Field Strength in dB μ V/m
- RR = RA - AG - AV in dB μ V
- LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

INTERTEK TESTING SERVICES

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission at 31.850 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 8.7 dB

INTERTEK TESTING SERVICES

Applicant: i.Tech Dynamic Ltd.
Model: C51-B305-XX
Worst-Case Operating Mode: Tx

Date of Test: May 13, 2009

Table 1

Radiated Emissions

Channel L

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2402.000	104.7	33	29.4	43.9	57.2	94.0	-36.8
H	*4804.000	52.6	33	34.9	43.9	10.6	54.0	-43.4
H	7206.000	40.7	33	37.9	43.9	1.7	54.0	-52.3
H	9608.000	40.4	33	40.4	43.9	3.9	54.0	-50.1
H	*12010.000	41.5	33	40.5	43.9	5.1	54.0	-48.9
H	14412.000	44.1	33	40.0	43.9	7.2	54.0	-46.8

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2402.000	104.7	33	29.4	101.1	114.0	-12.9
H	*4804.000	52.6	33	34.9	54.5	74.0	-19.5
H	7206.000	40.7	33	37.9	45.6	74.0	-28.4
H	9608.000	40.4	33	40.4	47.8	74.0	-26.2
H	*12010.000	41.5	33	40.5	49.0	74.0	-25.0
H	14412.000	44.1	33	40.0	51.1	74.0	-22.9

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205.

INTERTEK TESTING SERVICES

Applicant: i.Tech Dynamic Ltd.
Model: C51-B305-XX
Worst-Case Operating Mode: Tx

Date of Test: May 13, 2009

Table 2

Radiated Emissions

Channel M

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2441.000	104.9	33	29.4	43.9	57.4	94.0	-36.6
H	*4882.000	52.9	33	34.9	43.9	10.9	54.0	-43.1
H	*7323.000	41.4	33	37.9	43.9	2.4	54.0	-51.6
H	9764.000	41.2	33	40.4	43.9	4.7	54.0	-49.3
H	*12205.000	41.6	33	40.5	43.9	5.2	54.0	-48.8
H	14646.000	47.1	33	38.4	43.9	8.6	54.0	-45.4

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2441.000	104.9	33	29.4	101.3	114.0	-12.7
H	*4882.000	52.9	33	34.9	54.8	74.0	-19.2
H	*7323.000	41.4	33	37.9	46.3	74.0	-27.7
H	9764.000	41.2	33	40.4	48.6	74.0	-25.4
H	*12205.000	41.6	33	40.5	49.1	74.0	-24.9
H	14646.000	47.1	33	38.4	52.5	74.0	-21.5

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205.

INTERTEK TESTING SERVICES

Applicant: i.Tech Dynamic Ltd.
Model: C51-B305-XX
Worst-Case Operating Mode: Tx

Date of Test: May 13, 2009

Table 3

Radiated Emissions

Channel H

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (dB)	Calculated at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	105.7	33	29.4	43.9	58.2	94.0	-35.8
H	*4960.000	52.3	33	34.9	43.9	10.3	54.0	-43.7
H	*7440.000	41.5	33	37.9	43.9	2.5	54.0	-51.5
H	9920.000	41.1	33	40.4	43.9	4.6	54.0	-49.4
H	*12400.000	42.1	33	40.5	43.9	5.7	54.0	-48.3
H	14880.000	47.6	33	38.4	43.9	9.1	54.0	-44.9

Polarization	Frequency	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	105.7	33	29.4	102.1	114.0	-11.9
H	*4960.000	52.3	33	34.9	54.2	74.0	-19.8
H	*7440.000	41.5	33	37.9	46.4	74.0	-27.6
H	9920.000	41.1	33	40.4	48.5	74.0	-25.5
H	*12400.000	42.1	33	40.5	49.6	74.0	-24.4
H	14880.000	47.6	33	38.4	53.0	74.0	-21.0

- NOTES: 1. Peak Detector Data unless otherwise stated.
 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 * Emission within the restricted band meets the requirement of part 15.205.

INTERTEK TESTING SERVICES

Applicant: i.Tech Dynamic Ltd.
Model: C51-B305-XX
Worst-Case Operating Mode: Standby

Date of Test: May 13, 2009

Table 4

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	31.850	37.3	16	10.0	31.3	40.0	-8.7
V	32.110	37.0	16	10.0	31.0	40.0	-9.0
V	35.005	36.8	16	10.0	30.8	40.0	-9.2
V	42.105	36.1	16	10.0	30.1	40.0	-9.9
V	45.030	35.6	16	10.0	29.6	40.0	-10.4

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.

INTERTEK TESTING SERVICES

4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

8.0 **Miscellaneous Information**

The miscellaneous information includes details of the test procedure.

8.1 Measured Bandedge

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz and 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2003) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

For electronic filing, the above plots are saved with filename: be.pdf

INTERTEK TESTING SERVICES

Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designed (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

8.2 Discussion Pulse Desensitivity

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 625 μ s for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 2.1 + EDR, transmitter ON time is independent of the packet type (DH1, DH3 and DH5) and packet length (single-slot and multi-slot). The maximum transmitter ON time for the Bluetooth is 625 μ s.

Each TX and RX time slot is 625 μ s in length. A TDD scheme is used where master and slave alternately transmit. For one period for a pseudo-random hopping through all 79 RF channels, it takes: $79 \times (0.625 \times 2)\text{ms} = 98.75\text{ms}$.

Therefore,

$$\begin{aligned}\text{Average Factor (AF) of Bluetooth in dB} &= 20 \log_{10} (0.625/98.75) \text{ dB} \\ &= 20 \log_{10} (0.00633) \text{ dB} \\ &= -43.9 \text{ dB}\end{aligned}$$

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied

INTERTEK TESTING SERVICES

during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

9.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2251	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Oct. 28, 2008	Sep. 30, 2008	Oct. 02, 2008
Calibration Due Date	Oct. 28, 2009	Mar. 30, 2010	Apr. 02, 2010

Equipment	Spectrum Analyzer	Pyramidal Horn Antenna
Registration No.	EW-2188	EW-0905
Manufacturer	AGILENTTECH	EMCO
Model No.	E4407B	3160-09
Calibration Date	Dec. 18, 2008	Nov. 29, 2007
Calibration Due Date	Dec. 18, 2009	May 29, 2009